

Dietary fiber and prevention of diabetes type 2.

Analysis of the underlying factors

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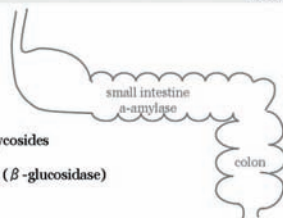
Dietary fiber and prevention of type 2 diabetes

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Danone Institute China
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Dietary fibers



Fibers: polymers of β -glycosides

Only bacterial breakdown (β -glucosidase)
-fermentable
-non fermentable

Production of Short Chain Fatty Acids (SCFA)
acetate, butyrate, propionate

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Dietary fiber reduces risk of chronic diseases

Chronic diseases: Colon cancer, CVD, diabetes type 2

Evidence since 1972 (Trowell & Burkitt) is increasing

Nowadays, the evidence is overwhelming

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Dietary fiber reduces risk of chronic diseases

Focus on diabetes type 2

Underlying mechanism(s) ?

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Dietary fiber & reduction of the risk of T2D

Possible mechanisms

- a) Reduction of energy intake / satiety
- b) Decrease of small-intestinal absorption of nutrients (glucose)
- c) Effect mediated by incretins (GIP, GLP-1)
- d) Biological effects of fermentation products
- e) Effect of "co-passengers" (bio-active components)
- f) Effect of microbiota

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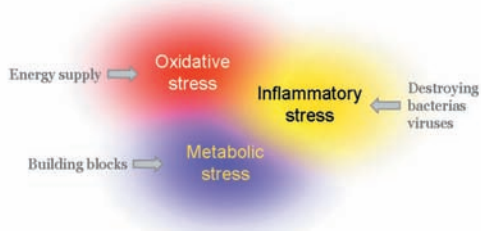
Dietary fiber & reduction of the risk of T2D

- > Possible mechanisms
- > Reduction of energy intake / satiety
- > Decrease of small-intestinal absorption of nutrients (glucose)
- > Effect mediated by incretins
- > **Biological effects of fermentation products**
- > **anti-inflammatory aspects**
- > **Effect of "co-passengers" (bio-active components)**
- > **anti-inflammatory aspects**

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Metabolic balance



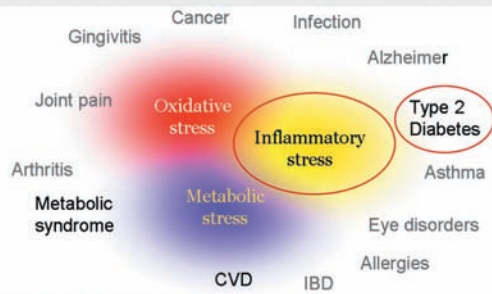
Metabolic inflammation

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Where does it come from?

1. Postprandial inflammation induced by overload of saturated fat or sugars (unbalanced diet)

Metabolic dysbalance and chronic diseases



Metabolic inflammation

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Where does it come from?

1. Postprandial inflammation induced by overload of saturated fat or sugars (unbalanced diet)
2. Dysfunction of adipose tissue (fat tissue)

Metabolic inflammation

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Metabolic inflammation or chronic low grade inflammation →

Induces / attenuates insulin resistance and disrupts β cell function →

Development of type 2 diabetes

Metabolic inflammation

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Where does it come from?

1. Postprandial inflammation induced by overload of saturated fat or sugars (unbalanced diet)
2. Dysfunction of adipose tissue (fat tissue)

Metabolic inflammation

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Where does it come from? What are treatment targets?

Intracellular signalling of inflammation in PBMC in human

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- › Stimulation by fat or glucose
- › Intracellular signalling
- › Activation of NF- κ B (nuclear transcription factor)
- › Production of inflammatory factors (cytokines)
 - IL-6, TNF- α , ICAM, VCAM
- › PBMCs and cytokines can be used to monitor inflammation



Quality of our food: Balanced vs un-balanced diets

Unbalanced food

products with low nutrient density and high energy density

- fast food
- cookies
- soft drinks



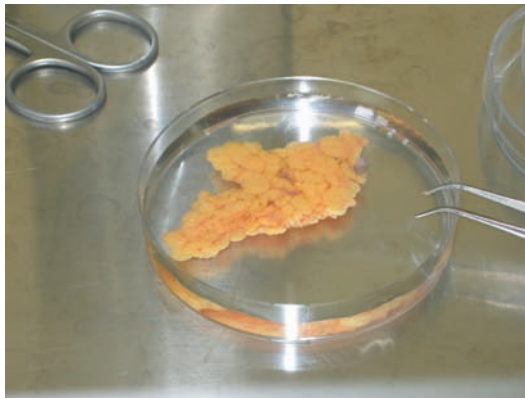
Balanced food: high nutrient density

Metabolic inflammation

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Where does it come from?

1. Postprandial inflammation induced by overload of saturated fat or sugars (unbalanced diet)
2. Dysfunction of adipose tissue (fat tissue)

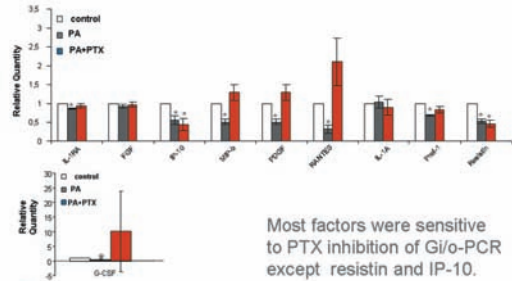


Adipose cells secrete inflammatory factors

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- >
- > Genomic and proteomic analyses of adipose cells
- > Adipose cells have the machinery to secrete inflammatory factors
- > (Meijer et al. Plos One 2011)

Anti-inflammatory effects of propionate on adipose tissue



Counteracting metabolic inflammation

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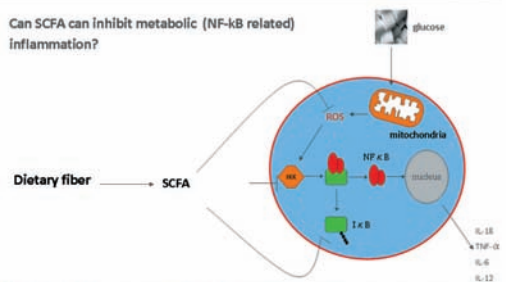
Metabolic inflammation \rightarrow type 2 diabetes

Anti-inflammatory compounds

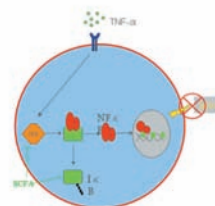
Inhibition of inflammation by SCFA

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- > Can SCFA can inhibit metabolic (NF-kB related) inflammation?

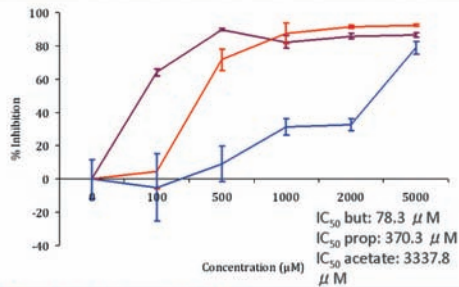


Reporter cell line: inhibitory effect of SCFA on NF-kB activation



- > Significant inhibition of TNF- α -induced NF-kB activation
- > in H293-NF-kB-RE reporter cell line (Meijer et al. Food Chemistry 2014)

SCFAs inhibit NF- κ B activation in a HEK293 reporter cell line



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Anti-inflammatory effects of dietary fiber

- >
- > Co-passengers: bio-actives associated with dietary fiber
- > Anthony Fardet, Nutr Res Review, 2010
- > Whole grain: 13% dietary fiber
- > 2% bio-actives
- > Candidates: Phytosterols, sulfur compounds, myo-inositol phenolic compounds etc

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Conclusions (1)

- Dietary fiber important for reducing risk type 2 diabetes
- Metabolic inflammation involved in developing type 2 diabetes
- Adipose tissue (obesity / inflammation) plays a role
- Post-prandial inflammation plays a role
- β cell inflammation plays a role
- Anti-inflammatory compounds are relevant
- Balanced diets should be promoted

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Quality of our food: balanced vs un-balanced diets

Unbalanced food

products with low nutriëntdensity and high energydensity

- fast food
- cookies
- soft drinks



Balanced food: high nutriëntdensity

dietary fiber, vitamins, essential nutrients, bioactives (anti-inflammatory compounds)

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Conclusions (2)

Consumption dietary fiber should be stimulated:

- Whole grain products
- Vegetables, fruit
- Product development based on dietary fiber and anti-inflammatory compounds

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KOPPERT CRESS
Architecture Aromatique

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questions and contact

谢谢!

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